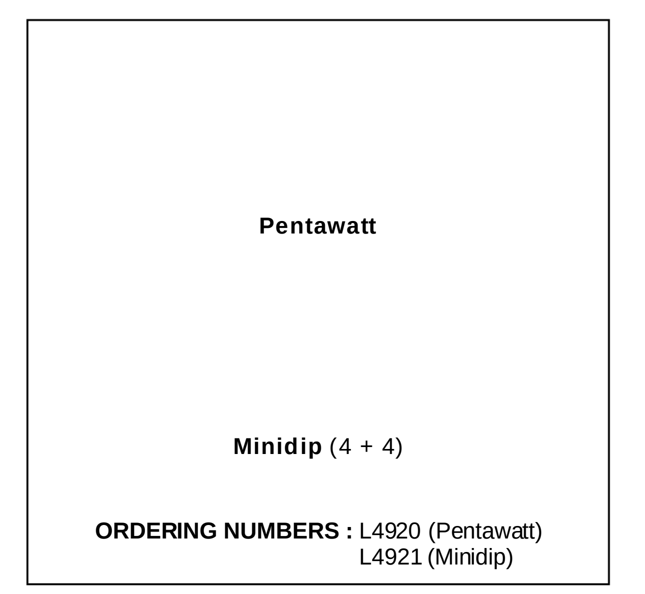



# L4920
# L4921

## VERY LOW DROP ADJUSTABLE REGULATORS

- VERY LOW DROP VOLTAGE
- ADJUSTABLE OUTPUT VOLTAGE FROM 1.25V TO 20V
- 400mA OUTPUT CURRENT
- LOW QUIESCENT CURRENT
- REVERSE VOLTAGE PROTECTION
- + 60/ – 60V TRANSIENT PEAK VOLTAGE PROTECTION
- SHORT CIRCUIT PROTECTION WITH FOLD-BACK CHARACTERISTICS
- THERMAL SHUT-DOWN



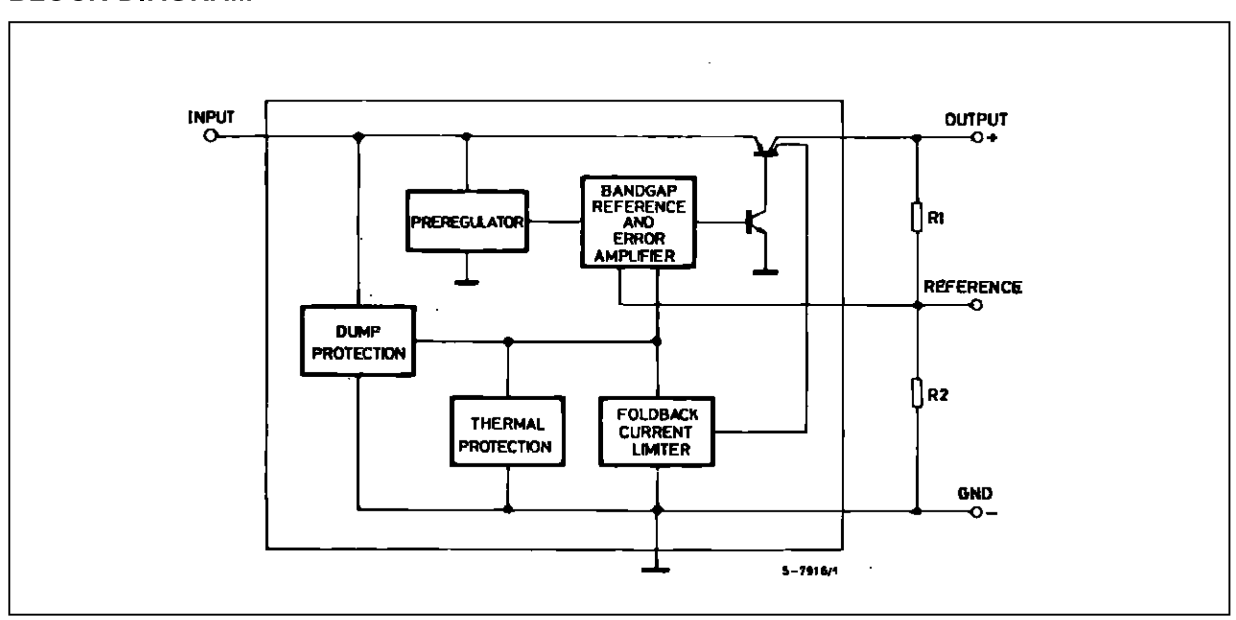

**ORDERING NUMBERS :** L4920 (Pentawatt)
L4921 (Minidip)

### DESCRIPTION

The L4920 and L4921 are adjustable voltage regulators with a very low voltage drop (0.4V typ. at 0.4A $T_j$ = 25°C), low quiescent current and comprehensive on-chip protection.
These devices are protected against load dump and field decay transients, polarity reversal and over heating.
A foldback current limiter protects against load short circuits.
The output voltage is adjustable through an external divider from 1.25V to 20V. The minimum operating input voltage is 5.2V ($T_J$ = 25°C).

These regulators are designed for automotive, industrial and consumer applications where low consumption is particularly important.
In battery backup and standby applications the low consumption of these devices extends battery life.

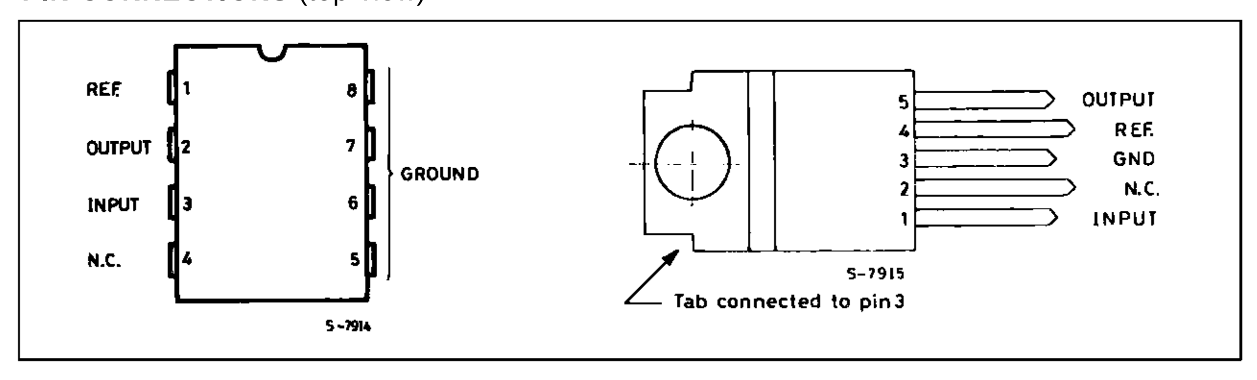
### BLOCK DIAGRAM



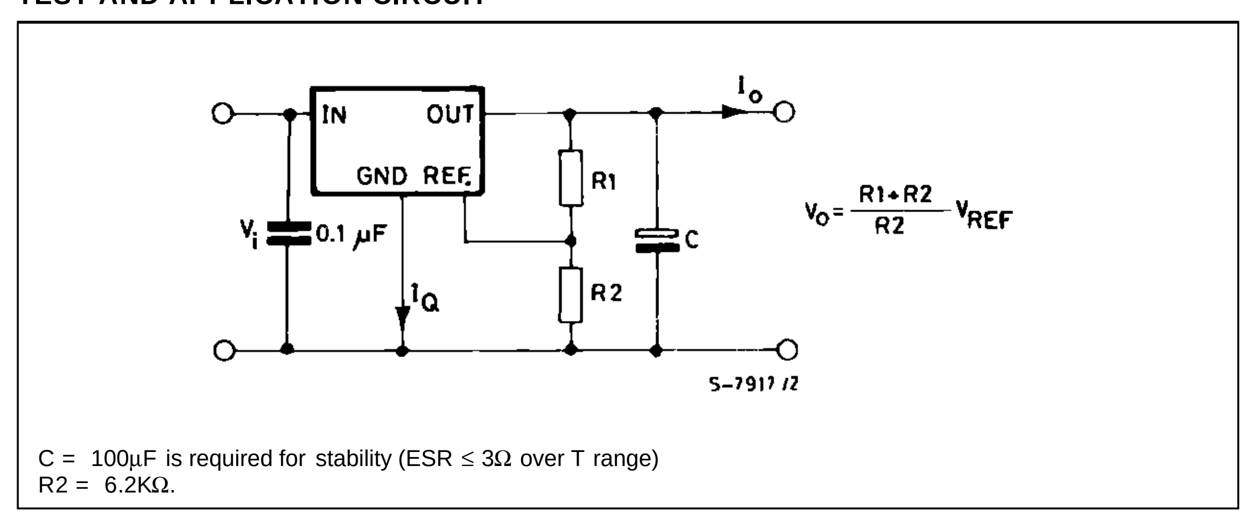
## ABSOLUTE MAXIMUM RATINGS

| Symbol | Parameter | Value | Unit |
|---|---|---|---|
| $V_i$ | DC Input Operating Voltage<br>DC Reverse Input Voltage<br>Transient Input Overvoltages:<br>Load Dump:<br>5ms ≤ $t_{rise}$ ≤ 10ms<br>$\tau_f$ Fall time constant = 100ms<br>$R_{SOURCE}$ ≥ 0.5Ω<br>Field Decay:<br>5ms ≤ $t_{fall}$ ≤ 10ms, $R_{SOURCE}$ ≥ 10Ω<br>$\tau_f$ Rise time constant = 33ms | 35 | V |
| $T_J$, $T_{STG}$ | Junction and Storage Temperature Range | – 55 to 150 | °C |

## PIN CONNECTIONS (top view)




## TEST AND APPLICATION CIRCUIT




C = 100µF is required for stability (ESR ≤ 3Ω over T range)
R2 = 6.2KΩ.

## THERMAL DATA

| Symbol | Parameter | | Minidip (4 + 4) | Pentawatt |
|---|---|---|---|---|
| $R_{th\ j\text{-}amb}$ | Thermal Resistance Junction-ambient | Max | 80 °C/W | 60 °C/W |
| $R_{th\ j\text{-}pins}$ | Thermal Resistance Junction-pins | Max | 15 °C/W | – |
| $R_{th\ j\text{-}case}$ | Thermal Resistance Junction-case | Max | – | 3.5 °C/W |





**ELECTRICAL CHARACTERISTICS** (for $V_I$ = 14.4V, $T_J$ = 25°C, $V_O$ = 5V, $C_O$ = 100µF, unless Otherwise Specified)

| Symbol | Parameter | Test Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $V_I$ | Operating Input Voltage | $V_O \geq 4.5V$, $I_O$ = 400mA | $V_O$ + 0.7 | | 26 | V |
| | | $V_{REF} \leq V_O < 4.5V$, $I_O$ = 400mA | 5.2 | | 26 | V |
| $V_{REF}$ | Reference Voltage | $5.2V < V_I < 26V$<br>$5mA \leq I_O \leq 400mA$ (*) | 1.20 | 1.25 | 1.30 | V |
| $\Delta V_O$ | Line Regulation | $V_O + 1V < V_I < 26V$, $V_O \geq 4.5V$<br>$I_O$ = 5mA | | 1 | 10 | mV/V |
| $\Delta V_O$ | Load Regulation | $5mA \leq I_O \leq 400mA$ (*) $V_O \geq 4.5V$ | | 3 | 15 | mV/V |
| $V_D$ | Dropout Voltage | $I_O$ = 10mA<br>$I_O$ = 150mA<br>$I_O$ = 400mA | | 0.05<br>0.2<br>0.4 | <br>0.4<br>0.7 | V<br>V<br>V |
| $I_Q$ | Quiescent Current | $I_O$ = 0mA<br>$V_O + 1V < V_I < 26V$ | | 0.8 | 2 | mA |
| | | $I_O$ = 400mA (*)<br>$V_O + 1V < V_I < 26V$ | | 65 | 90 | mA |
| $I_O$ | Maximal Output Current | | | 800 | | mA |
| $I_{OSC}$ | Short Circuit Output Current (*) | | | 350 | 500 | mA |

(*) Foldback protection

**ELECTRICAL CHARACTERISTICS** (for $V_I$ = 14.4V, $-40 \leq T_J \leq 125$°C (note 1), $V_O$ = 5V, $C_O$ = 100µF, unless Otherwise Specified)

| Symbol | Parameter | Test Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $V_I$ | Operating Input Voltage | $V_O \geq 4.5V$, $I_O$ = 400mA | $V_O$ + 0.9 | | 26 | V |
| | | $V_{REF} \leq V_O < 4.5V$, $I_O$ = 400mA | 5.2 | | 26 | V |
| $V_{REF}$ | Reference Voltage | $5.4V < V_I < 26V$ | 1.17 | 1.25 | 1.33 | V |
| $\Delta V_O$ | Line Regulation | $V_O + 1.2V < V_I < 26V$, $V_O \geq 4.5V$<br>$I_O$ = 5mA | | 2 | 15 | mV/V |
| $\Delta V_O$ | Load Regulation | $5mA \leq I_O \leq 400mA$ (*) $V_O \geq 4.5V$ | | 5 | 25 | mV/V |
| $V_D$ | Dropout Voltage | $I_O$ = 150mA<br>$I_O$ = 400mA | | 0.2<br>0.4 | 0.4<br>0.7 | V<br>V |
| $I_Q$ | Quiescent Current | $I_O$ = 0mA<br>$V_O + 1.2V < V_I < 26V$ | | 1,2 | 3 | mA |
| | | $I_O$ = 400mA (*)<br>$V_O + 1.2V < V_I < 26V$ | | 80 | 140 | mA |
| $I_O$ | Maximal Output Current | | | 870 | | mA |
| $I_{OSC}$ | Short Circuit Output Current (*) | | | 230 | 500 | mA |

(*) Foldback protection.
**Note :** 1. Design limits are guaranteed (but not 100% production tested) over the indicated temperature and supply voltage ranges. These limits are not used to calculate outgoing quality levels.

**Figure 1 :** Output Voltage vs. Temperature.

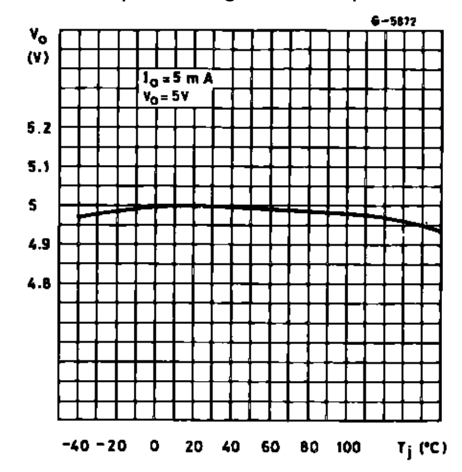



**Figure 2 :** Foldback Current Limiting.

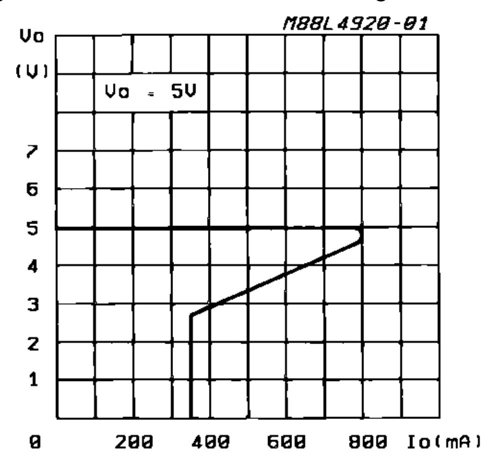
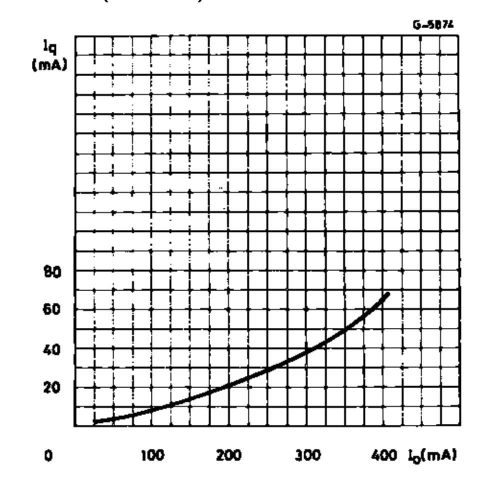



**Figure 3 :** Quiescent Current vs. Output Current ($V_o$ = 5V).




## APPLICATION INFORMATION

1) The L4920 and L4921 have $V_{REF} \cong 1.25V$. Then the output voltage can be set down to $V_{REF}$ but $V_i$ must be greater than 5.2V ($T_j$ = 25°C).

2) As the regulator reference voltage source works in closed loop, the reference voltage may change in foldback condition.

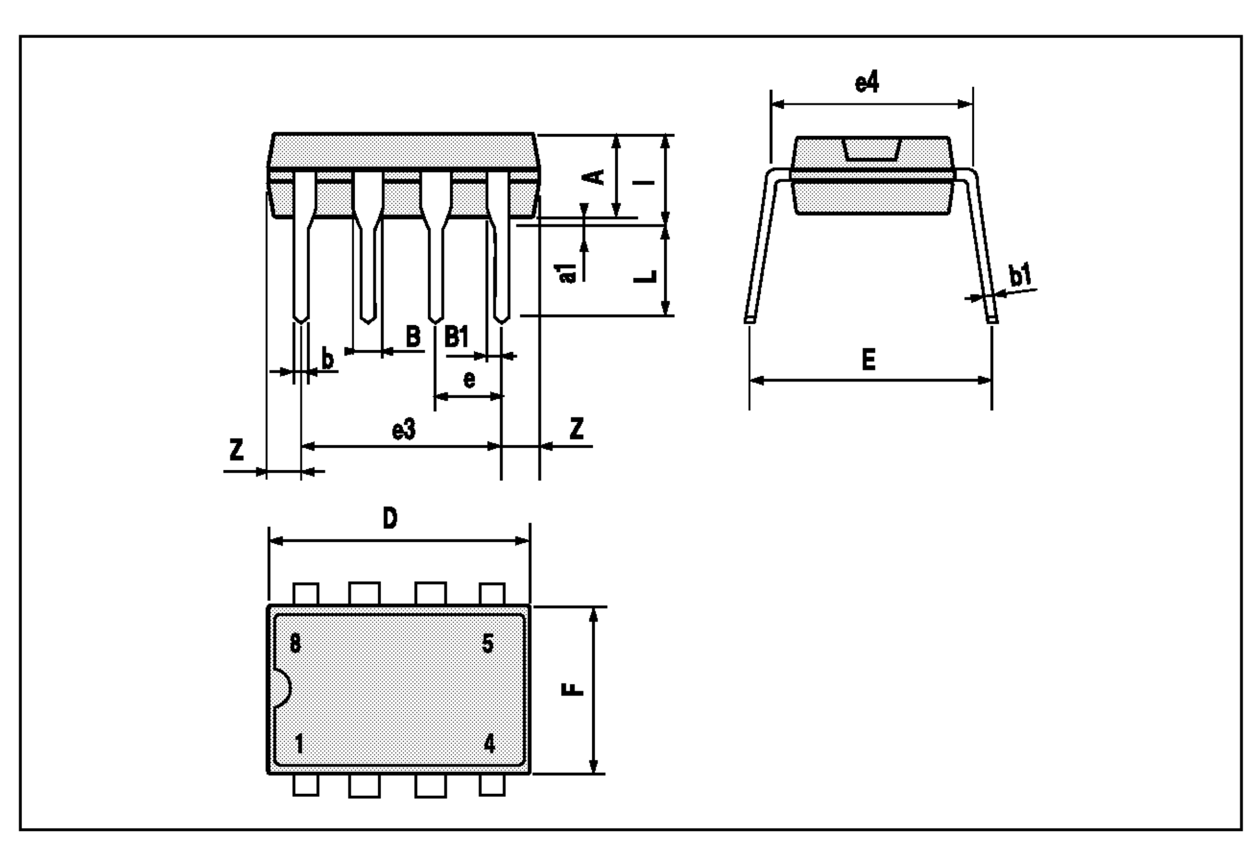
3) For applications with high $V_I$, the total power dissipation of the device with respect to the thermal resistance of the package may be limiting . The total power dissipation is :

$$P_{tot} = V_i I_q + (V_i - V_o) I_o$$

A typical curve giving the quiescent current $I_q$ as a function of the output current $I_o$ is shown in fig. 3.

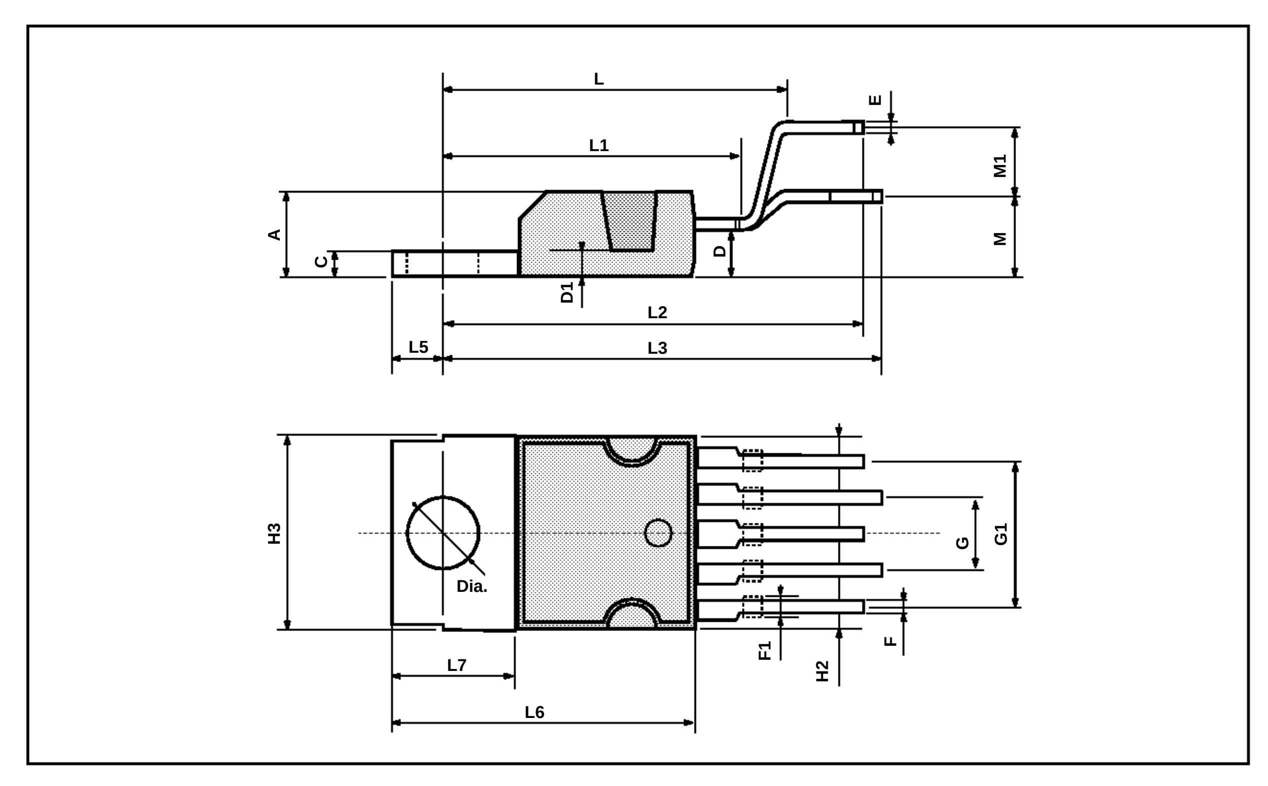
## MINIDIP 4+4 PACKAGE MECHANICAL DATA

| DIM. | mm | | | inch | | |
|---|---|---|---|---|---|---|
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| A | | 3.3 | | | 0.130 | |
| a1 | 0.7 | | | 0.028 | | |
| B | 1.39 | | 1.65 | 0.055 | | 0.065 |
| B1 | 0.91 | | 1.04 | 0.036 | | 0.041 |
| b | | 0.5 | | | 0.020 | |
| b1 | 0.38 | | 0.5 | 0.015 | | 0.020 |
| D | | | 9.8 | | | 0.386 |
| E | | 8.8 | | | 0.346 | |
| e | | 2.54 | | | 0.100 | |
| e3 | | 7.62 | | | 0.300 | |
| e4 | | 7.62 | | | 0.300 | |
| F | | | 7.1 | | | 0.280 |
| I | | | 4.8 | | | 0.189 |
| L | | 3.3 | | | 0.130 | |
| Z | 0.44 | | 1.6 | 0.017 | | 0.063 |



## PENTAWATT PACKAGE MECHANICAL DATA

| DIM. | mm | | | inch | | |
|---|---|---|---|---|---|---|
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| A | | | 4.8 | | | 0.189 |
| C | | | 1.37 | | | 0.054 |
| D | 2.4 | | 2.8 | 0.094 | | 0.110 |
| D1 | 1.2 | | 1.35 | 0.047 | | 0.053 |
| E | 0.35 | | 0.55 | 0.014 | | 0.022 |
| F | 0.8 | | 1.05 | 0.031 | | 0.041 |
| F1 | 1 | | 1.4 | 0.039 | | 0.055 |
| G | | 3.4 | | 0.126 | 0.134 | 0.142 |
| G1 | | 6.8 | | 0.260 | 0.268 | 0.276 |
| H2 | | | 10.4 | | | 0.409 |
| H3 | 10.05 | | 10.4 | 0.396 | | 0.409 |
| L | | 17.85 | | | 0.703 | |
| L1 | | 15.75 | | | 0.620 | |
| L2 | | 21.4 | | | 0.843 | |
| L3 | | 22.5 | | | 0.886 | |
| L5 | 2.6 | | 3 | 0.102 | | 0.118 |
| L6 | 15.1 | | 15.8 | 0.594 | | 0.622 |
| L7 | 6 | | 6.6 | 0.236 | | 0.260 |
| M | | 4.5 | | | 0.177 | |
| M1 | | 4 | | | 0.157 | |
| Dia | 3.65 | | 3.85 | 0.144 | | 0.152 |



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